REMARKS

Claims 1-13 and 15-24 are pending in the application.

Claims 1 and 11 are amended above to more clearly set forth what the applicant regards as the invention.

The dependency of claim 24 is corrected to depend upon claim 23.

New independent claims 25-28 are added to the application. New claims 25-28 correspond to original claims 4, 9, 12 and 15 rewritten in independent form except that the term "from the fluid" has been replaced with the term "between the fluid and the structure" in each of the claims.

I. THE ALLOWABLE SUBJECT MATTER

The examiner indicated that claims 19-24 were allowed in the final rejection. The examiner also objected to claims 4, 6, 7, 9-10, 12-13 and 15-17 for being dependent upon a rejected claim but would be allowable if rewritten in independent form including all of the limitations of base claim and any intervening claims.

II. THE ANTICIPATION REJECTIONS

The examiner finally rejected claims 1-3, 5, 8, and 11 for anticipation by Smitherman et al. U.S. Patent No. 5,879,082. While temperature probe 18 illustrated in Smitherman et al. bears superficial resemblance to the preferred embodiments of probes P1, P2 and P3 employed in the present invention (e.g., they are all elongate structures with two thin film resistance element temperature sensors), as will be shown below, claims 1-3, 5, 8, and 11 are novel over Smitherman et al. because both the claimed methods of use of the probes and their claimed structures differ substantially from those of Smitherman et al.

While the present inventions are useful for measuring a variety of different streams, one application in particular aids in the understanding of the novel differences between the claimed invention and the prior art. In the embodiment, the present invention is used to measure unsteady and very hot gas flows, such as at the combustor exit of a gas turbine engine where temperatures typically reach around 2000°K (page 1, first two paragraphs of the application) and the flow is extremely turbulent. In this embodiment, a device with a high frequency response is required.

Moreover, the claimed method of measuring temperatures exposes a probe only briefly to the hot gas flow (so that the probe structure doesn't itself actually attain the temperature of the fluid) and the fluid temperature is derived from the transient heat fluxes into two adjacent regions of the probe having different thermal products, through the respective temperature sensitive elements. Two different regions are used as it enables the fluid temperature to be derived without also knowing the applicable convective heat transfer coefficient, as explained on page 4, lines 10-26 of the application. To accomplish this, the two probe elements have to be sufficiently close to each other to experience substantially the same flow conditions.

There is no suggestion in Smitherman et al. that their probe is suitable for such service. Instead they are concerned with measuring the temperature of reagents flowing in a chemical processing plant, where flowrates are likely to be substantially more constant, and no particular temperature ranges are mentioned. Indeed, the method adopted by Smitherman et al. is to derive the heat flowing **along** the probe between spaced apart temperature sensitive elements. This inevitably has a slower response time than the present invention and is inherently unsuitable for measurement in unsteady gas flows. It is furthermore necessary for Smitherman et al. also to know the velocity of the fluid flow (column 5, lines 30 -32), which is not a requirement of the present invention.

Independent claims 1 and 11 are novel over Smitherman et al. at least because the probe structure in these claims has two **adjacent** temperature sensitive elements which are exposed to substantially the **same** fluid flow conditions while Smitherman et al. discloses temperature sensitive elements (such as 22 and 24) that are **spaced apart** along the probe. (See Smitherman et al. Abstract, lines 2-4; column 1, lines 58-59; column 2, lines 3-4; column 5, lines 17-18; and column 9, lines 18-19 of the reference). It follows, therefore, that the temperature sensitive elements of Smitherman et al. cannot be exposed to substantially the same flow conditions, and indeed it is obvious that they cannot be because Smitherman et al's temperature measurement process depends on heat transfer **along** the probe. In this process it is necessary for only one of the temperature sensitive elements actually to be exposed to the flow and in the embodiment illustrated in the reference the element 24 will not be exposed at all to the flow in the conduit to which the element 22 is exposed, because element 24 is at a position coinciding with the wall of the conduit.

Independent claims 1 and 11 are also novel over Smitherman et al. because the described structure is only exposed **temporarily** to the fluid. This is a consequence of the fact that although the structure has regions of different thermal products adjacent to the two temperature sensitive elements, they are closely adjacent to each other and would *eventually* equalise in temperature if the probe was exposed for too long. This is not a concern for Smitherman et al, however, whose temperature sensitive elements are spaced apart and not in any event exposed to the same flow conditions. Therefore, the claimed feature of "temporarily exposing" the device to the fluid also causes independent claims 1 and 11 to be novel over Smitherman et al.

Claims 1 and 11 are also novel over Smitherman because the claimed structure provides **respective** regions for the diffusion of heat **between** the fluid and the structure through the **respective** temperature sensitive elements, and the thermal products (defined at page 5, line 9 of the application) within said regions **differ** such that said elements experience **different** heat transfer rates due to such diffusion when exposed to the **same** fluid temperature. Smitherman et al's method does not involve derivation of heat transfer **rates between** the structure and the fluid at the locations of the two temperature sensitive elements, which are caused to differ when exposed to the same fluid temperature due to differences in the thermal products of the regions into which the heat diffuses. Instead they are concerned with deriving the heat transfer **rate** (singular) **along** the probe between the location of one element and the other. There is accordingly no description in the reference of structuring the probe with two regions of different thermal products as claimed. The Examiner nevertheless speculates in relation to the previous versions of these claims that such differences exist for the two elements 22 and 24 due to the mention of an alumina ceramic potting compound for element 24 at column 6, lines 40 -42 of the reference. Such speculation is moot in relation to independent claims 1 and 11, however, because:

- any such "regions" for the elements 22 and 24 in the reference are spaced apart and not **adjacent** to each other as they implicitly are for the regions in the claims because the claimed elements are themselves adjacent;
- as indicated above, the element 24 in the reference is not in any event exposed to the fluid; and

- it follows also that the two elements 22 and 24 are not exposed to the **same fluid temperature**.

For this reason as well, independent claims 1 and 11 as well as their dependent claims 2-3, 5 and 8 are novel over Smitherman et al.

Independent claims 1 and 11 are further novel over Smitherman et al. because the claims require derivation of (or means to derive) the **respective** heat transfer rates between the fluid and the structure experienced by the temperature sensitive elements and derivation of (or means to derive) the temperature of the fluid from a relationship of the temperatures of those elements and those derived heat transfer rates. Smitherman et al. however do not derive those two heat transfer rates and does not consequently use them to derive the fluid temperature. Instead, Smitherman et al. uses a heat transfer rate **along** the probe. Clearly, therefore, there can be no anticipation of claims 1 and 11 by Smitherman et al. for this reason as well.

III. THE OBVIOUSNESS REJECTION

The examiner rejected claim 18 for being obvious over Smitherman et al. in view of Ngo-Beelmann . Claim 18 depends upon claim 11. Claim 18 is non-obvious at least because Smitherman et al. does not disclose the features of claim 11 recited in Section II above. In addition, due to the inherently slow frequency response of Smitherman et al's probe it would not have been obvious to one skilled in the art at the time of the invention to use it for post-combustion temperature measurement within a gas turbine engine notwithstanding that a (completely different) probe is proposed for such use by Ngo-Beelmann.

CONCLUSION

Pending application claims 1-13 and 15-28 are believed to be patentable for the reasons indicated above. Favorable reconsideration and allowance of the pending application claims is courteously solicited.

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